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CARNIVOROUS PLANT NEWSLETTER

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CARNIVOROUS PLANT NEWSLETTER

Official Journal of the
International Carnivorous
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Sarracenia purpurea, an original watercolour painting by Wendy Walsh, published in *An Irish Florilegium* by W.F. Walsh, R.I. Ross and E.C. Nelson (London, 1983).

The co-editors of CPN would like everyone to pay particular attention to the following policies regarding your dues to the ICPS.

All correspondence regarding dues, address changes and missing issues should be sent to Joanne Klingensmith, 437 Las Rientas, Fullerton, CA 92635. **DO NOT SEND TO THE CO-EDITORS.** Checks for subscriptions and reprints should be made payable to ICPS.

All material for publication, comments and general correspondence about your plants, field trips or special noteworthy events relating to CP should be directed to one of the co-editors. We are interested in all news related to carnivorous plants and rely on the membership to supply us with this information so that we can share it with others.

Views expressed in this publication are those of the authors, not necessarily the editorial staff.

Copy deadline for the March 1987 issue is January 1, 1987. The September and December 1986 issues of CPN will be combined into a special CP world list.

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SPECIAL ISSUE ANNOUNCEMENT

CP World List

The September and December Carnivorous Plant Newsletters will be combined into a special, fifty-four page issue, devoted exclusively to the new *CP World List*, compiled by Jan Schlauer of the Federal Republic of Germany.

The columns that are regularly featured in each newsletter (News and Views, Literature Review, Want Ads and Seed Bank) as well as advertising and other articles will *not* be run in this issue due to its length.

The *CP World List* issue is scheduled for a November mailing to the CPN readership. Included with this special issue will be your 1987 membership renewal envelope. There will be *no other* renewal notice sent to you prior to the March 1987 issue, which is the next CPN to be published after the special *CP World List* issue.

NEWS AND VIEWS

ORGEL BRAMBLETT (18950 S.W. 136th St., Miami, Florida 33187) writes: Here is another picture of the recent CP display at the Fairchild Gardens which we do every year. This time we feature Bruce Bednar explaining CP to the many visitors that are viewing our display. Bruce is the one with the beard.



JONI EMRICH (1125 Hayes Ave., Fremont, OH 43420) suggests that a videotape round robin be started among interested ICPS members. She proposes that this might be handled as follows: Those members with video cameras and VCR's (would have to decide on Beta or VHS format) could send around tapes on which they have recorded five minutes or so (SP) over their previous contribution but not disturbing others, then sending the tapes on down the robin list. Talks, demonstrations of techniques and views of plants could be shared. The interested parties could equally divide the cost of the tape. If you are interested, contact Joni at the above address. She is also interested in acquiring *Nepenthes* cuttings, including early hybrids. She is also interested in buying any excess CP anyone might have.

RON GAGLIARDO (Hungry Plants, 1216 Cooper Dr., Raleigh, NC 27607) has recently restarted his CP tissue culture business and has a price list available. He sends us the following information about himself and his aims.

"I've been asked to give a little personal information about myself and my background. Well, here's the "lowdown." I am age 20 and am a junior at North Carolina State University where I am majoring in botany and chemistry.

"I initially became involved in tissue culture back in 1982 through Bill Carroll who was operating a lab at the North Carolina Botanical Garden over in Chapel Hill, NC. Bill showed me around his lab and I was hooked. I quickly learned the basic techniques and methods of "cloning" plants. After participating in research in several labs on campus at NCSU, I set up a lab of my own and began cloning CP.

"I am currently working on over 50 species/varieties of CP including a few rarities such as *Byblis gigantea*, *Drosera cistiflora* and various *Nepenthes* spp. While my buddies at school were out partying on Friday nights, I'd be working in the lab on my next *Sarracenia* hybrid or something. Needless to say, I am not an expert in this area but I have been successful in getting many CP and a few non-carnivores into culture. I hope to continue my tissue culture work and I am gearing toward some of the endangered species whose future may depend on artificial propagation in the laboratory."

RON also writes: I would address those interested in carnivorous plant tissue culture and how to acclimate tissue cultured plants to soil:

- 1) Use a soil mix of two parts peat moss and one part sand, vermiculite, or perlite. Wet the mixture before using. Sterilizing the soil in an oven at 180 degrees for 4-5 hours will be helpful in destroying potentially harmful microbes.
- 2) Remove the gel (agar) from the tube by gently tapping the bottom of the tube and allowing the contents to slip out.
- 3) Rinse any agar off the roots with slightly warm water and then clusters of plants may be slightly loosened. DO NOT PULL INDIVIDUAL PLANTS APART!!!
- 4) Set the plants into the soil mix so that the roots are completely covered.
- 5) Water the plants in with a weak solution of fertilizer. For example, Miracid or Rapidgro (¼ tsp./ Liter); Schultz Instant Liquid Plant Food (15-20 drops/ Liter).
- 6) Cover the plants with clear plastic and set in a semi-shaded location (ie. under a greenhouse bench or under fluorescents indoors, etc.) for 7-10 days. After the first 4-5 days, begin removing the plastic a little bit each day to gradually adjust the plants to less humidity. Plants should be "toughened up" within 2 weeks. Gradually increase light level as needed for the specific plant type.

NOTE: Should mold or fungus appear during acclimation process, apply a general fungicide (ie. Benomyl, Benlate, etc.) full strength.

7) As the plants grow, they will produce more roots, and in 60-80 days should be ready for further division. Fertilize every 1-3 months during the growing season.

"In late May 1983, fellow CP'er Bill Carroll and I decided to make a run down to Florida. After visiting friends, etc. in the middle of the state (near Apopka), we headed for the Gulf Coast. Knowing nothing about the actual habitat, we consulted our trusty Florida Highway Map and soon found ourselves headed for some place called "Appalachicola."

"Upon our arrival to what appeared to be a very, very small town, we asked some of the locals about carnivorous plants. Most of them didn't even know what a plant was, but finally we got some directions to what was termed a "mushy, wet spot." Sure enough, we made it to our "mushy, wet spot" and discovered a few CP. Among them were *Pinguicula ionantha*, *Drosera filiformis* v. *tracyi*, *Drosera capillaris*, *Sarracenia leucophylla* and a strange variation (or some hybrid with) *psittacina*.

"The most interesting thing was that there appeared to be two different flower colors in the *P. ionantha*, white and purple. This was seen in plants that were growing directly beside each other, too!! Everything else about the plants was identical, except the flower color. We took a few of each back with us and the corresponding colors persisted the next Spring. Any ideas?

"The remainder of our "excursion" was spent driving around the northern Florida-Georgia-Alabama area. We never spotted the White flower/Purple flower *P. ionantha* mix again."



White and Purple flowered forms of *P. ionantha*.

DONALD POLENSKY (4912 Tamarack Way, Irvine, CA 92715) writes: Here are a few memories to share regarding bog hopping in southern New Jersey. Mention a ghost town and images of the old west come to mind - perhaps an old mining town in the Sierras or a stage stop in New Mexico that is long forgotten and neglected. The words, Carnivorous plants and swamp, evoke thoughts of a steaming jungle in some remote corner of South America or the Malaysian peninsula. I was, therefore, surprised to learn of an association of carnivorous plants in a small, abandoned town in southern New Jersey.

Driving south on route 563 to Atlantic City, I found myself in the middle of Wharton State Forest, in the heart of the New Jersey Pine Barrens. Immediately after crossing the Oswego river, there is a small historical marker noting the now abandoned town of Harrisville. A short, 15-minute walk around the area reveals an artesian spring, the remnants of a factory, which as of 5 years ago had only one wall left, and a small network of narrow canals that supplied water to the paper mill factory. Crossing the road and hiking along the east shore of a 20-acre lake reveals nothing particularly exotic in the way of South Jersey flora. However, 45 minutes later I came across small patches of *Drosera intermedia* poking out of the shallow pools of water along the lake side. A few moments later, patches of sphagnum moss were found underneath shrubs and cedars near the lake. An occasional *Drosera rotundifolia* could be spotted poking out from the mossy cushions. In another five minutes, I found myself looking over a three-acre sphagnum bog, dotted with an occasional *Sarracenia purpurea* and numerous sundews. Entrance to this bog was marked by a narrow, sandy beach just covered with *Drosera filiformis*. The ideal time to view such a sight is from late-May to June. Mosquito and deer flies aren't too bad but I would definitely take along a can or two of insect repellent. The New Jersey Department of Transportation had been rebuilding a dam on the lake and I suppose by now the long sloping beaches that supported so many *D. intermedia* and *D. filiformis* are now gone under a foot or so of water.

REFERENCE

Beck, Henry C., *Forgotten Towns of Southern N.J.*, Rutgers University Press, New Brunswick, N.J.

J.B. STAHL (700 Mulberry St., York, PA 17403) writes: In response to inquiries as to where members can purchase topo. maps, mentioned in "Cataloging," CPN 14 (2); if a dealer cannot be located in the yellow pages under maps or sporting and camping outfitters, members East of the Mississippi River should write to:

U.S. Geological Survey
Eastern Distribution Branch
1200 S. Eads St.
Arlington, VA 22202

All other members write to:
U.S. Geological Survey
Western Distribution Branch
P.O. Box 25286 Federal Center
Denver, CO 80225

Ask for an "index sheet" for the state which concerns you; cost will be about \$2.00. These sheets are simplified state maps showing the relative locations, titles, and order numbers of your topo. maps. Then order the topo. map for area of concern, price about the same.

CURTIS YAX (233 Chestnut St., Oneonta, N.Y. 13820) writes: One of the best programs devoted solely to CP was just on the PBS network, Sunday night, March 22. This was part of the NATURE series. All the major trap forms were examined, from the fantastic Venus' Fly Traps to the subtle pitcher plants. A unique animated segment showed the electrical impulses from the trigger hair of the *Dionaea* leaf. *Aldrovanda* was shown catching water fleas by the dozen and a slow motion sequence stole the show with aquatic *Utricularia* traps popping *Daphnia* larvae into its opening!

Some very rare plants like *Roridula dentata* were presented as defensive, but not carnivorous, plants. It made me wonder about this after seeing all the dewdrops and dead insects on the leaves. Some creepy music played in the background as many insects were caught, killed and digested, giving testimony to the fact that CP were made for this type of life. Some species of *Drosera*, *Nepenthes*, *Cephalotus* and a group of *Heliamphora nutans* were seen in their natural surroundings. A new species of bromeliad was said to be carnivorous but it didn't look like *Brocchinia reducta*. The show ended with the carnivorous seeds eating insects!

Unfortunately, a great deal of time was wasted on discussing the various versions on evolution which is all speculation and not scientific fact. Other fascinating information could have been shown the viewer, but the show was great because of the creative photography, and I'll be looking forward to seeing the repeat.

Recently, on WILD WORLD OF ANIMALS, which is also on the PBS network, they had an excellent program on wetlands. There was a zoom-in-photo of a large colony of *Drosera intermedia* growing in the marshy water. Many leaves were sandwiched around their prey. A time-lapse segment displayed sundews catching their prey with amazing speed. In the near future on PBS, there will be a National Geographic special on the great Okefenokee Swamp of Southeastern USA. I've seen this quaking bog on other specials and *Sarracenia minor* 'giant' and the sundews are usually shown. Another documentary about acid rain, which is caused partly by the exhausts of automobiles, showed dying forests and lakes in the Adirondack mountains. After viewing this terrible sight for about an hour, the narrator ended the program by saying that a brand-new plant was found growing into the water by the shore—it was long strands of sphagnum moss!

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Patrick Dwyer (St. Michael's Episcopal Church
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venosa (3), *S. purpurea venosa chipoca* (4), *S. rubra wherryi* (10); *Utricularia affinis* (1), *U. aurea* (10), *U. capensis* (5), *U. lateriflora*, *U. longifolia* (5), *U. racemosa*, *U. subulata* (5), *U. uliginosa* (3), **Sarracenia Hybrids:** *S. alata/minor*, *S. oreo/alata*, *S. purp. venosa/leuco*, *S. alata/leuco*, *S. oreo/psitt × leuco*, *S. psitt/purp × leuco/minor*, *S. flava × leuco/purp*, *S. flava/leuco*, *S. rubra gulf/leuco × leuco/minor*, *S. leuco/minor*, *S. leuco/rubra wherryi*, *S. leuco/minor × rubra*, *S. psitt/purp × rubra*, *S. psitt/purp × minor/psitt/rubra × leuco*, *S. purp/psitt × minor × alata/minor*, *S. psitt/purp × minor*, *S. alata* (red) *× oreo/alata*, *S. psitt/purp × rubra × oreo/alata*, *S. alata/minor*, *S. leuco/purp*, *S. leuco* (dark) *× flava* (red tube, green lid), *S. oreo × flava* (red tube, green lid), *S. leuco* (dark) *× flava rugellii*, *S. rubra jonesii × purp*. A few others in really small quantities.

*For instructions on how to send or order seed, see CPN March 1986.

CPN Donors

Our sincere thanks to the below people who have donated seed to the seed bank.

(Jan. 1, 1984 - March 22, 1986)

6,557 Packets Donated by 68 Donors

J. Hummer	1050
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T. Litnin	40	I.M. Wall	2
L. Mellichamp	40		
R. Charnock	35		

1986 CP SOURCES "Extras"

Please note these changes in your 1986 CP Sources List, printed in the March issue of CPN.

New sources: Cedar Ridge Nurseries
R.D. #1, Cedar Ridge Rd.
Allison Park, PA 15101

Marie's Orchids and Carnivorous Plants
6400 Cedarbrook Drive
Pinellas Park, FL 33565

Catalog Price — free

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World Insectivorous Plants catalog price is \$1.00.

Marston Exotics serves other countries now, not just Europe.

Lee's Botanical Gardens, 12731 SW 14th Street, Miami, FL 33184. B-S-T all varieties of Carnivorous plants. List Free.

(REMINISCENCES — IV)

CPN FIRST — PART 2

by Donald Schnell

We told you we would be back with more CPN firsts, in case you did not see your favorite one in the first article; and there will be more. Here are a few more articles or significant projects that at least partially, if not wholly, in some way seem unique to CPN.

In Vol. 4, p. 51, and with further detail in Vol. 6, p. 7, Lynn Macey began and nearly completed a truly massive and ambitious retrieval system for CP literature. This sort of thing had been done before in certain variations for botany as a whole and a few other plant groups, but not for CP specifically and the system Lynn called KWIC, one of those computer acronyms which are now all around us these days. Lynn's system was to take in all CP printed material like a sponge, and then set it up in his computer so that the material could be retrieved through various descriptors. There was a complete bibliographic listing plus a summary of the paper or book if available. So far we have a storage system. The neat part is that Lynn set up the program in such a way that material could be retrieved by calling up any one of several categories; you could call up one author, a genus, a species, a general topic such as cultivation or ecology (either in overall generality or according to one genus or species or author), or any one of several descriptors.

Lynn started out with all the Literature Review stuff in CPN, then went to bibliographies of various papers and books (such as Lloyd—Here there were often no summaries unless he could gain access to the reference, some of which were quite old and obscure). We all helped with as much time and material as we could provide, and the latest total printout from the program measures close to three inches thick as it sits before me here while I write this. Glancing through, I come

across authors, propagation, pest control, parasites—all sorts of categories which would certainly save a literature searcher a lot of time.

The project reached an advanced stage, and copies of the printouts were available for cost of paper since Lynn was using a borrowed computer. Alas, Lynn was transferred from his computer and also became pressed for time so the project was arrested with the last printout about 1977. Maybe someday it can be resumed, caught up, and again be available to all serious CP enthusiasts. In the meantime, I often refer to my copy when searching the literature on a topic through 1977.

DISPLAY OF CP

In Vol. 5, p. 25 appeared the first listing of public or otherwise accessible botanic gardens that had significant displays of CP. Again, the overall concept was not new, it having been done by other plant societies for their specialties. But it was the first one for our favorites, CP. The list was arranged according to countries, and judging from comments and letters, was well received. Of course, we missed a few initially, and the list was made more complete by mention of additional gardens in later issues. It occurs to me that perhaps we should undertake another complete listing (complete as far as we know and that matches the scope of that first listing) in an upcoming CPN issue. If so, let us know whether you would like to see this. The first step is some indication of interest from YOU. The next step will be for us to place notices in several issues of CPN asking that everyone anywhere who knows of a garden (public, or private ones that the owner is willing to show with prearranged

permission) send in the name, exact address or location of the garden or greenhouse, and of course the country. So it is up to you.

SEED BANK

One of our most pragmatic firsts made its initial appearance in Vol. 6, p. 44, after having been discussed in several previous issues and announced in the prior issue. The CPN Seed Bank has been one of the most active and valued projects of CPN. At the risk of repeating myself, I realize still again that many plant societies have seed banks, as do many botanical gardens that are available to selected people. But, by golly, this was the first one dedicated to CP and it is still going strong today.

Patrick Dwyer offered to handle the seed bank for us, and I am not sure he knew exactly what he was getting into at first in terms of time and work. It turns out that Patrick is the perfect choice. He has been taking care of the project since its inception, in spite of a very busy schedule with his work, coaching and playing on volleyball teams that often traveled all over the country, and working on his other hobbies and service projects. Patrick has been consistent, dedicated, enthusiastic and hard working, and I cannot say enough in appreciation for and to him for all of us. The bank is run on the principle of seed donations by us all, these being meticulously divided up into packets and stored dry under refrigeration. To defray his cost for materials and postage, there is a modest service charge, and there is an arrangement whereby seed donors are given credits so they may obtain seed later on at no cost. This is all explained in clearer detail in each March issue of CPN.

As is the case with all volunteer activities of this sort, the "balance" of the seed bank has been quite variable over the years, this depending on willingness to make seed donations. This is a good time to put in a strong plug for all you potential donors to get pollinating and seed collecting, sending your material to Patrick care of his address found in any CPN issue. The seed should be fully mature, clean, and sent carefully and clearly labeled in one container or bottle depending

on seed type and size. Send only freshly collected seed as soon as possible after collection. Avoid putting miniscule seed (e.g. *Droseras*, *Utricularias*) in plastic bags since static causes them to adhere to the plastic and they are impossible to retrieve without wastage. After receiving the seed and dividing it up into packets for storage, Patrick will send you a note letting you know how many packets your donation amounted to and what your credits are. Neat, huh? So collect and donate, but be ACCURATE! Patrick can only duplicate what you label the seed on each packet.

PINGUICULA IDENTIFICATION

Now here is a first that I think is truly a "first first." In Vol. 7, p.43F, Jurg Steiger described a unique method of recording the characteristics of *Pinguicula* flowers in a standardized fashion. You might at first comment, "So what?," especially if you have not been into *Pinguiculas* much or checked out herbarium sheets of the species, or looked at the herbarium sheet photos in Caspar's monograph.

The problem, you see, is that in so many *Pinguiculas* the vegetative portions of the plants look exactly alike, or so similar that the artifacts of pressing for herbarium storage blurs the subtle differences. Therefore, we are very often dependent on the appearance of the flower for good identification. You guessed it—The pressing process for herbarium storage often makes the flower nearly worthless for identification processes. Enter modern photography techniques and Jurg's creative imagination. He conceived the minimum number of angles from which a *Pinguicula* flower could be photographed to show all important gross identification features, then described how the three views could be placed in one photo frame by using three flowers from the same species or variety or whatever, set up the best background, and then a card catalogue system for each photo that gave valuable location, ecologic, horticultural and other ancillary data. His article was illustrated with 27 photos and summaries of material from his record cards.

The importance of the paper lies in an effort to imaginatively overcome limitations of traditional herbarium pressed plant technique by supplementing the material with *standardized* photographs and ancillary information. Jurg also mentioned that this could be applied, with proper modifications, to other CP groups. I can think of another Lentibulariaceae genus as a likely candidate right off-*Utricularia*.

SLIDE SETS

This important article led to our first effort in providing slide sets to CPN readers. The editors had been approached about this for several years. Such a project sounds not too difficult at first—Until you do it! The problem of how many sets to reproduce, cost of initial inventory to get the best price on multiple orders of sets from processors, and the logistics of mailing, storage and handling waivers turned out to be quite a problem. So I tried it anyway, investing my own funds in an initial duplication of ten sets of 63 slides, generously donated by Jurg for the project.

The cost was my cost plus postage, and that was all. Enthusiasm sometimes runs head on into reality and after having announced these slide sets that so many people seemed to want in the June, 1979 issue of CPN, I finally got rid of the last one just last year! Needless to say, we have been somewhat gunshy about doing this again, but there has been demand for various sets from newer subscribers who may have not been aware of the mixed history of this first effort, and I suppose that possibly with some sort of system of prepaid guaranteed purchases, we might try it again. We'll see.

We have now come to the point in this series, REMINISCENCES, where we would like to hear from you about it. Do you want to keep it or drop it? Is it of any value to you? Let us know, and do not be afraid to be frank. You won't hurt our feelings in the least. We conceived the series as of possible interest on a regular basis and decided to try it. So it is just a trial, and we look at it pragmatically if you do not want it.



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CARNIVOROUS PLANTS IN IRELAND

1. NATIVE SPECIES

by E. Charles Nelson
National Botanic Gardens
Glasnevin, Dublin 9
Republic of Ireland

An island, set on the western fringe of Europe, with an impoverished native flora of about twelve hundred species, may not seem too propitious a place for an interesting carnivorous flora. But, with a mild and equable climate due to the ameliorating influence of the North Atlantic Ocean, and a thick blanket of acid peat covering about 17% of the land surface, Ireland does harbour a diverse group of insectivores, representatives of three genera. These plants provide botanists with interesting geographical problems, and the historical associations of the carnivorous plants are also worth recording.

The earliest published records of native Irish plants appeared in *Theatrum botanicum*, published at London in 1640 by the English herbalist, John Parkinson. He noted two plants, the strawberry tree (*Arbutus unedo*) and a sundew which had been sent to him by an Irish apothecary, Zanchie Sylliard. We cannot be certain which species of sundew Parkinson received, but it was most probably *Drosera anglica*. The publication of this record provoked a correction ten years later, when the Rev. Richard Heaton, retorted that "I gave some of the plant to Zanchie Sylliard, Apothecary of Dublin, which he sent to Mr. Parkinson, who in his description mentions the said Zanchie as if he had found it" (How, 1650). Heaton, an English priest who arrived in Ireland in 1633 (Walsh, 1978), provided several other first records of Irish species, but none of the others was carnivorous (Nelson, 1979).

Richard Heaton described his sundew thus: "Long-leaved Rosa Solis . . . the leaves are above a span long" - a span is reckoned to be about nine inches—and he found it " . . . plentifully in a Bogge by Edenderry," which is a small town in the centre of Ireland,

surrounded by extensive peatlands. The only *Drosera* species in Ireland with leaves approaching this size is *D. anglica*, which is not as common in Ireland as *D. rotundifolia*. *D. anglica* is most frequent in the western part of the island, whereas *D. rotundifolia* can be found throughout Ireland in suitable habitats. The third native species is *D. intermedia*, and like *D. anglica*, this has a predominantly western distribution pattern. A fourth taxon is also recorded in Ireland, *D. x oboyata*, the natural hybrid between *D. rotundifolia* and *D. anglica*.

All the Irish sundews are restricted to acidic, peaty habitats, and although commercial exploitation of peat is extensive, none of the species is endangered as there are many small peat bogs that cannot be used for peat cutting. Peat or turf is still dug by hand, and the sods, once dried, provide winter fuel for many people - until the discovery of natural gas offshore this was Ireland's only natural fuel source apart from a very small coal reserve. In the pools left by peat cutting, it is not unusual to find bladderworts. There are four species of *Utricularia* recorded from Ireland, and they all inhabit the pools of acid water associated with the peat lands.

The bladderworts are not conspicuous plants, even when in flower, and many amateur naturalists may not realize what these "pond weeds" are. The native species are *Utricularia vulgaris*, *U. neglecta*, *U. minor* and *U. intermedia*. *U. vulgaris* is not common in the centre and west of Ireland, but is frequent in the south. The other species tend to be more common in the west, but these trends reflect the distribution of suitable habitats rather than the ecology of separate species.

(Continued on page 44. Photos next 2 pages.)



Pinguicula grandiflora photographed near Laragh, County Kerry, in June 1985.



Pinguicula vulgaris photographed in County Fermanagh June 1985; growing in wet flush in the foothills of Cuilcagh Mountain.



Pinguicula vulgaris photographed in County Fermanagh June 1985; growing in wet flush in the foothills of Cuilcagh Mountain.



Drosera intermedia growing near Clifden, County Galway in the west of Ireland.



Sarracenia purpurea at Termonbarry, County Roscommon, photographed in July 1982.
Photos by E.C. Nelson

Neither *Drosera* nor *Utricularia* are particularly conspicuous members of the native flora - to be sure, sundews are abundant on the peatlands, but they never form a floral spectacle. Nor, indeed, do the genera excite interest among plant geographers. But, the butterworts do provide one of the finest of Ireland's flowering plants and there is considerable interest in the extraordinary distribution pattern of this one spectacular plant.

Three species of butterwort occur in Ireland, *Pinguicula lusitanica*, *P. vulgaris* and *P. grandiflora*. The tiny, pale-flowered, grey leaved *P. lusitanica* is so small that it is often overlooked. It grows mainly in the west of Ireland in habitats which are not so impoverished as the peat bogs, for example, in wet flushes on hillsides where the water trickling down the rocks contains some dissolved mineral salts. In Britain, this species occurs only in the southwest and in the northwest of Scotland; it is often characterized as a member of the "Arctic" element of the flora. More abundant and more easily seen is *P. vulgaris*, the common butterwort, which has elegant purple flowers, like a small violet. I remember this plant very well, for I was shown it on the very first botanical trip that I ever made, when my parents brought me on an excursion organized by the local field naturalists' club. I must have been a lad of about seven. We went to an abandoned quarry in the hills of County Fermanagh, near my home, and on the quarry floor, where brown mineral-rich water was oozing from cracks in the rocks, were hundreds of the butter-green rosettes of a strange plant that ate flies! I still enjoy finding *P. vulgaris*, and admiring its rosettes and three-lipped flowers. Like *P. lusitanica*, it prefers a moist, mineral-enriched habitat and does not grow on the unadulterated peatlands.

But the glory of the Irish flora is the greater butterwort, *P. grandiflora*, often called the Kerry butterwort because it is so abundant in that far southwestern county. Its home is the mountainous region around the famous lakes of Killarney, but it also occurs in very small numbers in the Burren

in County Clare. Outside Ireland it grows in the mountains of southwestern France and in moist habitats in the Iberian Peninsula. With the strawberry tree (*Arbutus unedo*), Irish spurge (*Euphorbia hyberna*), a clutch of *Saxifraga* species, and several heathers, among other plants, the Kerry butterwort forms the "Lusitanian" element of the Irish flora. This is characterized by species that are intolerant of frequent and severe frosts, and thus the plants have a distinctive distribution pattern, being generally restricted to the western and southwestern parts of Ireland. Some of the species mentioned, but not *P. grandiflora*, also occur as native plants in southwestern England.

In Ireland, *P. grandiflora* is abundant where it finds a suitable habitat. I have seen it growing like a weed on damp, shady roadsides and on the moorlands and mountain ridges above Killarney. It tends to occur where there is mineral enrichment, but will colonize areas of blanket peat.

The Kerry butterwort has large, deep blue flowers - the gems of the Irish summer. The colour has to be seen to be fully appreciated. The lower lip of the flower is not three-lobed as in *P. vulgaris* whose flowers are about half the size of the Kerry butterwort. Pink-flowered forms of *P. grandiflora* have been reported from Ireland, and Reginald Scully, author of the **The Flora of County Kerry** (1916) also reported that "forms with pure white flowers are, however, occasionally seen and have been gathered in the Gap of Dunloe by Lady Godfrey and on the east side of Caragh Lake by Capt. Creaghe-Howard..." This white form is not recorded elsewhere, nor is it in cultivation, and should anyone find such a plant, **it should be left alone** in its peaty home to flower **undisturbed**.

Lastly, *P. grandiflora* and *P. vulgaris* occasionally grow side by side and they then may hybridize. The hybrid, with flowers intermediate in size and shape between the parents, have been named *P. x scullyi*, after the author of the county flora.

(Please turn to page 54.)

CARNIVOROUS PLANTS IN IRELAND

2. *SARRACENIA PURPUREA*

by E. Charles Nelson
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Republic of Ireland

Sarracenia purpurea, known in Ireland simply as the pitcher plant, is not an indigenous species, but was introduced from eastern North America last century as a garden plant. The only native carnivores are species of *Drosera*, *Utricularia*, and *Pinguicula* (Nelson, 1986).

As far as I can ascertain, the first plants of *Sarracenia purpurea* grown in Ireland came to the Botanic Gardens in Glasnevin, Dublin, in June, 1894 "direct from North America" (Nelson, 1983).

There is no record at that time of pitcher plants in cultivation in private gardens, but it is very probable that there were plants in the other Irish botanical gardens, Trinity College Botanic Garden in Dublin, and the Royal Botanic Gardens in Belfast. Before long, David Moore, who was curator of the Glasnevin Botanic Gardens developed a strong interest in pitcher plants and began to assemble a comprehensive collection of species of *Sarracenia* (I will describe Moore's work on *Sarracenia* in a later paper). It was probably David Moore who experimented with the cultivation of pitcher plants out-of-doors in a "bog garden" which was created beside the pond in Glasnevin. *Sarracenia purpurea* proved to be hardy.

Beyond that we have only a very incomplete history of the introduction of hardy pitcher plants into Ireland, but it is well known that by the end of the nineteenth century *Sarracenia purpurea* was growing "wild" in at least one Irish bog.

In the herbarium of the National Botanic Gardens, Glasnevin, there is a specimen collected by H. Levenge in 1892 from a raised bog near Lisduff in County Laois (in central Ireland) (Foss & O'Connell, 1985). Robert Lloyd Praeger (1932) made an ob-

lique reference to a site in that county where an unsuccessful attempt had been made to naturalize *S. purpurea* - the species had died out at Lisduff before 1910 according to a manuscript in the National Botanic Gardens (Foss & O'Connell, 1985).

However, I have recently discovered an earlier account of *S. purpurea* growing in the wild in Ireland. Writing in *The Garden* in 1896, Frederick William Burbidge ("Veronica") remarked:

Only two years ago three fine specimens of the North American Huntsmans' Cup (*Sarracenia purpurea*) were found in an isolated and unfrequented bog in Queen's County by a party of sportsmen. I am sure of the plant, having had leaves sent to me for examination, but how it got there is still a mystery to everybody. As a fact, I believe that *Sarracenia* is there still.

Thus by 1884, the pitcher plant was established in Laois (the official modern name for Queen's County). It cannot now be ascertained if Burbidge was reporting the Lisduff site, but it is quite likely.

Whereas the Lisduff attempt ultimately did not succeed, a second experiment did. In 1906, Benjamin St. George Lefroy brought plants of *S. purpurea*, *S. flava* and *S. drummondii* (*S. leucophylla*, ed.) from Canada, and planted them on a raised bog in County Roscommon, at a place called Termonbarry, on the edge of the flood-plain of the River Shannon. *Sarracenia flava* and *S. leucophylla* did not survive, but *S. purpurea* thrived and reproduced prolifically until it had colonized about eighty acres. Subsequently, large-scale, peat-cutting operations

have obliterated much of the colony, but Bord na Mona (the state-owned peat company) set aside thirty acres to protect this remarkable population of alien plants.

Since Lefroy's introduction of pitcher plants to Termonbarry, the species has been transplanted to several other localities in Ireland (see Foss & O'Connell, 1985; Kertland, 1968). In 1930, Dr. Keith Lamb took three pitcher plants from Termonbarry to a bog near Woodfield, Clara, in County Offaly. Here the species multiplied and now there is a substantial colony on the raised bog. Seedlings are scattered over an area of about two acres. In 1963, perturbed by the threat to the original Termonbarry colony, T.A. Barry brought some plants to Bellacorrick in County Mayo, and plants still grow there although there is no substantial evidence of spread. He also placed two plants in a bog in eastern Ireland, at Newbridge in County Kildare (Kertland (1968) referred to this as Tankardstown, but Foss & O'Connell (1984, 1985) noted it under the name Mouds Bog). The other site where *S. purpurea* is thriving is at Abbeyleix, in County Laois, where a young colony was established about 1966 by Susan, Lady de Vesci (Nelson & de Vesci, 1981). What is remarkable at this bog is the obvious lines of seedlings radiating from the original parent plants - lines perhaps resulting from the dispersal of seed by strong gusts of wind.

Pitcher plants have also been recorded in three other localities in various parts of Ireland. At Coolatore, County Westmeath, plants from Termonbarry were established by Mrs. Upton, but when last reported (by Kertland, 1968) they were not thriving. There are no recent reports of plants at Coolatore. J.O. Bollard planted some *S. purpurea* at Derrydoan, also in County Westmeath; there were eighteen clumps in 1973 but none could be traced by Foss & O'Connell (1985) in July, 1984. Lastly, J. Newell transplanted some clumps from Termonbarry to Baylough, near Athlone, County Roscommon, in 1966 but there was

no trace of any plants at Baylough in February, 1984 (Kertland, 1968; Foss & O'Connell, 1985).

The bogs on which *Sarracenia purpurea* has become naturalized in Ireland have a varied surface vegetation. Seedlings will become established on bare peat and on *Sphagnum* hummocks, and the pitcher plants seem to thrive best in the wettest areas - when bogs have a dry surface (due to artificial drainage or peat cutting) the plants lack vigour and colonies may become extinct. Foss & O'Connell (1984, 1985) have provided valuable information on the ecology of this plant at its major Irish habitats.

The survival of *Sarracenia purpurea* in Ireland is undoubtedly due in large part to the plant's ability, even in an alien environment, to successfully set viable seeds. No research has been carried out on the pollinators of the Irish plants, nor has any work been done on the insects trapped in the pitchers. Seed dispersal is not far-ranging; there is no record of *S. purpurea* "jumping" from one bog to an adjacent bog by natural means - all the known sites have a documented history of introduction by man.

While this weird plant with its strange habits has enriched the Irish landscape - to see the crimson flowers and red and green pitchers nestling among the pale *Sphagnum* and grey lichens is a remarkable experience - botanists cannot welcome the interloper wholeheartedly. It is an aggressive weed when the environmental conditions suit it and it does oust native plants. In Ireland today, undamaged, pristine bogs are very precious as so many have been damaged by commercial exploitation of the peat. The Irish peatland is a precious natural resource in a land without other extensive reserves of fossil fuel, but intact bogs are also very valuable as wilderness areas. We must now be very cautious about damaging or polluting the remaining pristine bogs by introducing vigorous alien plants. This interloper is therefore not quite as welcome as it used to be, but no-one would suggest eliminating it

(an impossible task anyway) for in the end it does enrich our already altered flora. Let's keep pitcher plants, but let's keep them under control and resist the temptation to transplant them elsewhere. The risks to the last vestiges of an Irish wilderness are far too great.

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REVIEW OF RECENT LITERATURE

Bird, D.F., Kalf, J. Bacterial Grazing by planktonic lake algae. *Science* 231: 493-495 1986.

This report describes 6 carnivorous algae that consume large quantities of bacteria in several Canadian lakes. The algae belong to the genera: *Dinobryon* and *Uroglena* with the former genus ingesting almost 30% of its weight in bacteria per day. This grazing rate is of the same magnitude as marine microflagellates that lack photosynthetic pigments and are totally dependent on external carbon sources. In fact, *Dinobryon* was more efficient than crustaceans, rotifers and ciliate communities combined in removing bacteria from these lakes. Electron micrographs showed bacterial cells inside food vacuoles.

Bopp, M. and E. Weiler, 1985. Leaf blade movement of *Drosera* and auxin distribution. *Naturwissenschaften* 72:434.

The speed and intensity of leaf folding after prey stimulus or application of $\text{NH}_4\text{H}_2\text{PO}_4$ is enhanced by application of external auxin treatment. Experiments cited here confirm that external and endogenous auxin produces folding by moving from the leaf tip to the area of prey where growth is stimulated in cells on the underside of the leaf. DES

Farkas, MJ and RA Brust, 1985. The effect of a larval diet supplement on the development in the mosquito *Wyeomyia smithii* (Coq.) under field conditions. *Can. J. Zool.* 63:2110-2113.

This study was conducted within the water-filled leaves of *Sarracenia purpurea* L. A commercial fish food was selected as the diet supplement and standardized numbers of mosquito larvae and fluid were replaced in pitchers. The supplement significantly accelerated larval development with larger, more fecund adults. DES

Joel, DM, et. al., 1985. Ultraviolet patterns in the traps of carnivorous plants. *New Phytol.* 101:585-593.

A survey of the UV patterns of a wide diversity of CP traps showed conspicuous UV patterns somewhat similar to many flowers. The patterns are based on leaf tissue, nectar and fluid pools. The results are discussed with respect to the possibility that UV patterns may attract prey to some CP.

Joel, Daniel, M., 1985. Leaf anatomy of *Caltha dioneaefolia* Hooker (Ranunculaceae)—Is this species carnivorous? *Bot. J. Linn. Soc.* 90:243-252 (15 fig.).

The leaf of this species is composed of two lobes somewhat resembling *Dionaea* but no glandular structures or trigger hairs were noted and it was concluded that the species is non-carnivorous. DES

Johnson, CW, 1985. Bogs of the northeast. University Press of New England (Hanover, NH 03755, \$12.95 paper), 269 p., illustr.

This is a fine book that should be in the hands of serious CP enthusiasts who have an interest in field ecology as well as culture. The book is written at the layman level but contains a wealth of information on bogs (or peatlands, as the author correctly prefers) of the Northeastern United States, and also can be applied to bogs of the Midwest and Eastern Canada. There is a good discussion of bog classification and nomenclature with illustrations and diagrams. This is followed by chapters on the ecology, plants and animals of the bogs, including a short chapter on CP. There are many black and white, and color photos. There is a good bibliography, and the book concludes with a list of monitored and protected bogs which the reader

may visit in the Northeast. Of considerable interest is the quality of writing and approach—the author imparts his sense of wonder and mystery about bogs and being in them. DES

Kondo, K., Three new species of *Drosera* from Australia. Bol. Soc. Broteriana 57(2): 51-60 1984.

Three species of *Drosera* belonging to the *D. petiolaris* family were described. They are *D. dilatato-petiolaris*, *D. falconeri* and *D. lanata*.

Simola, L.K., Koskimies-Soininen, K. & Tomell, M. Glycolipids of turions and leaves of *Utricularia vulgaris* at different stages of development. Physiol Plant 65(1): 23-26 1985.

After the turions of *U. vulgaris* were germinated in long-day conditions, the glycolipid composition was compared with resting turions. No great changes were found in glycolipid classes during sprouting but there were differences noted in fatty acid proportions.

Mutant Flies-A Feast for One's Carnivores

by Gregory T. Shanos, 160 Budlong Ave., Warwick, R.I. 02888

The common fruit fly, *Drosophila melanogaster*, serves as an excellent source of nutrition for carnivorous plants. Through studying *Drosophila*, scientists have proposed models for the genetic mode of inheritance in higher organisms. Fruit flies can also serve as a constant supply of live food for CP. *Drosophila* are easily cultured, readily available, and require minimal space, mess, and expense.

D. melanogaster unlike the common housefly, *Musca domestica*, is only several millimeters in length and free of disease-carrying microorganisms. Thus hundreds of flies can be grown in a small culture vessel.

A starter culture is purchased from Carolina Biological Supply Company. The minimal materials required are a vial of flies, culture vessels, and a nutrient medium.

Carolina Biological has developed an ultimate patented formula that requires no sterilization of the medium. Equal volumes of Instant *Drosophila* Medium and distilled water are added to the culture vessel, along with a few grains of dried Brewers yeast. A harmless blue dye is added to the medium to aid in visualization of the larvae. The medium congeals within a minute, flies are introduced, and the vial is plugged. Plastic polyurethane foam or non-absorbent cotton make sufficient plugs. Plastic inserts are also added to the culture vessel to increase surface area.

Drosophila cultures should be kept at an optimum temperature of 20-25°C, (68-77°F). The generation time is approximately two weeks. It is generally recommended that cultures be grown at the lower limit of this

range, since higher temperatures are conducive to the growth of bacteria, fungi, and mites. Therefore, maintain two "parent" cultures to ensure a continued supply of flies.

Drosophila normally have red eyes, wings, and are capable of flight. These characteristics are the normal or wild-type, commonly found in nature. The culture of wild-type *Drosophila* can be a nuisance since the flies must be anesthetized prior to feeding. The anesthetic commonly used is ether. Ether is a hazardous compound since it is quite volatile, highly flammable and forms explosive peroxides upon standing. *Drosophila* need not be anesthetized at all if mutant flies are utilized.

Mutations are inheritable changes that occur in the chromosomes of all living organisms. Mutations can occur spontaneously or via chromosome damage by radiation or chemical means. *Drosophila* mutants have changes in eye color or shape, presence or absence of body hair/color, wing shape and form. The most "convenient" mutation for our purpose is a change in wing structure that impairs flight. Wing mutations of *Drosophila* are referred to as apterous, curly, curved, miniature, vestigial and wrinkled. There are also combinations of mutations such as vestigial wing/white eye, brown body/vestigial wing, white eye/minia-
 ture wing/forked bristles, etc. Since these mutants are incapable of flight, no anesthe-

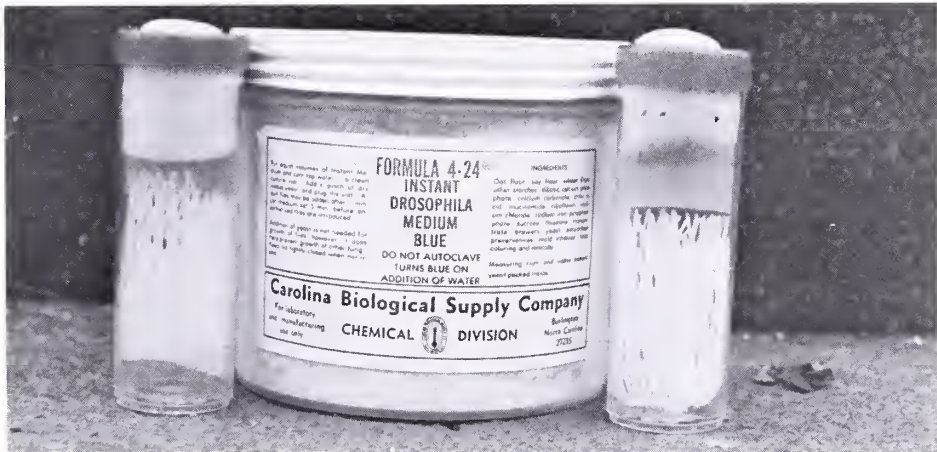
sia is necessary. The flies may simply be "sprinkled" upon the CP. It is fascinating to watch the carnivores lure the mutant victims to their inevitable fate.



Living *Drosophila* culture. Note various stages of life cycle are evident: larvae, pupae, adult.

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Minimum materials for the cultivation of fruit flies: nutrient medium, culture vessels, plugs, plastic inserts and caps.

A Commentary on Conservation from the Owner of a Commercial CP Nursery

by Bob Hanrahan (2130 Meadowind Lane; Marietta, Georgia 30062)

The following article is one I have considered for a number of years; it is not due to the difficulty in preparing an article for *CPN*, but to the subject matter. Back in the early 1970's, I initiated a strong conservation based policy in developing World Insectivorous Plants (WIP) and making its objectives based on commercial production of CP. My concerns for plant conservation were based on printed accounts that I had read on how plants were being removed from their natural ancestral homelands by commercial companies (so-called field collectors) at an astronomical rate, rapidly depleting them from the wild, to the point of near extinction. I was horrified with the thought of commercial CP companies going out into the field, ripping plants out, and stuffing them into a bag for resale. It did not seem ethical. It still isn't if the land is not owned, leased, or the owner compensated for the change in the plant life. Besides, it is illegal to do so in many states.

To get a first-hand look at the situation and to improve my understanding of CP populations, I made an extensive tour of the southeastern coastal areas (Mississippi to North Carolina) in 1975.

When I first visited the CP belt, I was impressed with the quantity of plants in the fields. Especially impressive was the Green Swamp in North Carolina. Even with all of the reported "rapes" by commercial companies, carnivores were easy to find along the roadways and in the natural forest areas. Having conversed with many of the "field collectors," they mentioned that there were so many plants in the Green Swamp that it would be decades before they would get scarce. They practiced a limited conservation program by taking only the larger plants,

thus enabling seedlings to develop. They scattered seed when it was available. The fallacy of this, of course, is that since only mature plants are able to flower and set seed, their removal eliminates future seed production capabilities.

Then something happened in the Green Swamp. The timber companies began to expand their pine plantations. Almost overnight, the CP population was annihilated. The only thing "green" about the Green Swamp today is the color of the trees and the money coming in from their sale. It was the bulldozers that did in the CP's, not the collectors. Now don't get me wrong, I am not espousing the virtues of field collecting for profit, but I would like to point out that habitat destruction is by far the greater evil when comparing collecting to land transformation.

During the 70's, pressure was put on companies that purchased or removed the majority of their plants from natural habitats to grow their own stock. I might add that the majority of these field collecting companies have since gone out of business. At that time, WIP and Sundew Environments were constantly espousing the benefits of buying greenhouse grown plants of which we more or less had a monopoly. Besides the obvious advantages of pest-free, controlled plants, our selections were not limited to the plants in the field. To compete, we had to produce and sell plants at prices competitive with field-pulled material. With the novelty of CP, coupled with the superb magazines available then (*House Plants & Porch Gardens*, *Plants Alive*, etc.) which touted CP, sales were brisk, and they enabled a business to succeed.

With the general decline in interest with houseplants in the late 1970's and continuing into the 80's, Sundew Environments ceased operations. WIP continued on, mainly due to the efforts of Ron Fleming and Jim Miller (WIP employees) in getting *Nepenthes* into wide circulation. My specialty, high volume production techniques and systems development were hampered by the many moves that transpired over the years. Nevertheless, WIP managed to continue on a subsidized basis, maintaining its conservation based ideals.

Most recently, a number of articles in *CPN* and other publications have pointed out the ruthless destruction of natural habitats and the consequences that may follow. Television programs, such as the famous Jacques Cousteau series and "Nature," have documented quite vividly the change in ocean life and the declining situation with tropical rain forests. The movie "Emerald Forest" portrayed the dying life of a tribe in Brazil that was forced to cope with massive environmental changes. Destruction of habitats will continue as underdeveloped countries use their easily obtained natural resources to pay their debts and supply the wealthy nations with low cost wood and meat products. It has been stated that for every quarter pound of hamburger obtained from cattle raised on former tropical forest (now grasslands), 15 square meters of virgin rain forest were destroyed. Rainforest soils are so poor that only a handful of cattle can be supported on an acre of the previously forested jungle.

This brings us to the point of this article. What can be done to change the tide? Long term, probably nothing; short term, something, and I define long term as centuries and short term as decades. It has been established that retention of natural habitats is the only true way to save or even attempt to insure species survival into the distant future. Therefore, all attempts should indirectly lead to this conclusion. Organizations such as the Nature Conservancy have begun to purchase natural areas and have a number of bogs under their jurisdiction. Our state and nation-

al forest and parks are supposedly protected, but government lands of any sort have limited protection due to the ease of access by citizens.

Since we are strictly interested in CP habitats, wouldn't it be prudent for CPN to be in a position to purchase bogs for the preservation of CP. To do so would require the financial aspects typical of most corporations, but it could be done if we all pull together. A little known fact is that due to the economics of printing, 2000 copies of CPN are printed for each issue. With the usual 700 to 800 members each year, over 1200 copies are stored as unsold copies. If these 1200 copies were to be sold, CPN would be able to not only have more color photos and larger issues, but begin to consider paying for articles as other national magazines do. With more subscribers, land purchases could possibly be considered.

How can you help? If every member would get a new member each year, growth would be phenomenal. Is that too much to ask? CPN could give a free subscription to each member who enlists a certain number of new members. They could use this "bonus subscription" for a gift or to extend their own subscription beyond the normal time period.

It would be nice for commercial CP specialty nurseries to purchase bogs and retain them as natural preserves or use them for plant production. Unfortunately, rare plants such as CP have a real restricted market appeal, and that translates to limited sales. That is part of the reason why garden centers only stock one or two varieties of carnivores. It is only through the acquisition of new customers that CP firms can stay in business. With this limited appeal, it is not economical for CP firms to stock all varieties of plants. Collectors will trade among themselves anyway to get something new. They will only use the commercial nursery when something new, different or rare is offered and that is getting exceedingly difficult today because of the wide assortment of plants that have been offered over the years (200+ by WIP alone since 1976). Another fact needs

to be presented. While CP interest is growing around the world, the US market is declining. This is not just my viewpoint, but of others in the commercial trade. In addition, CP collectors are used to buying plants for a few dollars and have not accepted the true costs of growing rare plants on a commercial basis.

The problem is that most CP operations are run as "hobby businesses" and as side income for the operator. Consequently, profit and loss is of little importance. Because of the hobby nature of the nurseries, they are not able to provide financial assistance to protect natural habitats, but there is something they and others can do. They could grow plants and replant natural habitats or increase the plant's range by planting them in areas that could support them. Unfortunately, our governmental agencies who have been created to protect the flora seem to be more interested in only isolating plant colonies to their present locations. For instance, it would be easy for us living in the southeast to repopulate *S. oreophila* habitats that have been known in the past with our surplus plants. Growing 10,000 *S. oreophila* for transplanting is easy. Yet we are stymied in our efforts. I would not recommend placing any plants on private lands unless you own them. Ideally, it might be best to use the US Forest Service, or state/national forest for "dumping grounds" but efforts to do so have been met with negative results. I have to agree with Faith Campbell of the National Resources Defense Council that the Federal Government is not really interested in saving restricted habitat plants such as CP. We as avid plant collectors have to pull together and do it on our own. So on to the next means of protection.

The last means of protecting the plants is the direct approach. That is for the private citizen to purchase natural habitats and act as a protector. This can be expensive, but it is effective. I have purchased a rather large bog myself and know of a few concerned collectors who have done likewise. Between us, we have diversified habitats that, if retained, will put off habitat destruction during our lifetimes. Perhaps these new protected areas will become confiscated by

the government as eminent domain because of future rarity of certain CP's. The way natural areas are being destroyed in the southeastern coastal areas (I have seen remarkable degradation in only ten years), one may have difficulty in finding any natural stands left in just a number of decades.

It is very important to keep genetically pure species in the wilds as a gene pool for future generations. This fact has become ever so important now that genetic engineering is coming of age. Many desirable traits from pure stock and their variants are being transferred back into our staple food and horticultural crops to restructure adaptability and to overcome pathogen related problems. Incidentally, many of the obscure original species hardly resemble their modern counterpart with all of the hybridization and selective breeding that has transpired over the centuries.

In retrospect and summary, it has become quite apparent that my personal philosophy on preservation differs greatly from the path that has been established in the United States. As a grower-conservationist, I would like to see the retail plant market swamped with artificially propagated endangered species, making them so common and readily available that their removal from natural areas would be superfluous. Superficially, I would like to see commercially grown *S. oreophila* and other protected plants in every garden center around the world. Of course, such a concept is not warranted and feasible since the demand for CP (especially the endangered species) is not that great.

If you are sincerely serious about CP conservation, you will wait for rare plants to be commercially grown by reputable nurseries. Purchasing plants "a la contraban" or by their extraction from habitat only encourages more of the same activities to continue. Ultimately, the choices that have been proposed, along with others, are for you alone to consider and ponder over. However, if we do not collectively establish the correct course, act accordingly, and adhere to it, our posterity might not have any choices to select from. Extinction seems to be permanent

Simplistic CP Fertilization Facts

by Bob Hanrahan, 2130 Meadowind Lane, Marietta, CA 30062

It is a well known fact that mature carnivores are quite adept at capturing sufficient prey in the wilds to meet their nutritional requirements. But what of life in a controlled greenhouse where insects are discouraged and even eliminated by other means? Most endearing collectors have resorted to using manmade fertilizers periodically to stimulate their plants. The only question that remains is how much, how often, what kind, and how to apply the fertilizer. Over the years, I have grown countless thousands of different carnivores and have developed the following thoughts on the matter. I provide them to you as a starting point and not as an end or absolute rule to follow. It has been my policy to experiment, and I encourage you to do the same when surplus plants are available and considered expendable.

I have found that all of the commercially available houseplant fertilizers that I have used are acceptable to CP in diluted application rates. I personally use the "K-Mart" brands which are similar to the "Miracle Gro" series because they are readily available on sale a couple of times a year. A two-pound box lasts me over a year (at constant use) with a large quantity of plants. The smallest available box should last the hobbyist for a number of years. I alternate between the acid type (30-10-10) and the standard type (15-30-15) indiscriminately.

The most stringent policy that I try to adhere to is a consistent application program of twice-a-week for both seedlings and mature plants. I prefer to feed at highly diluted rates, 1/10 to 1/20th full-strength, on a nearly continual basis to promote plant growth, rather than a full-blown feed once a month. This constant low-level nourishment

forces growth continually, which is preferred for commercial production when time-grown programs have to be met. All feeding programs are discontinued when plants are in a dormant state.

The application device that I use is a "fogger" type sprayer. It puts out a heavy mist that totally surrounds the plants with the fertilizer solution. I am able to get nearly 100% coverage of foliar material, even with plants growing in dense proximity. Electrically operated foggers are expensive, and for many years I used a hand operated sprayer (both canister and finger-pump types) with similar success. Collectors can use a finger-pump type but must be careful to avoid over-watering your plants. You want to mist them, not swamp them. *Drosera* are the best guide as to application rates. The more active *Drosera* (*D. capensis*, *D. hamiltonii* and *D. rotundifolia*) will really curl and fold up with excessive or near full-strength fertilizer. Experimentation with your sprayer and type of fertilizer-to-water ratio will determine the proper level for you to use. Ideally, *Drosera* tentacles will just bend in slightly, an hour or two after being fertilized. You can direct your sprays into *Sarracenia*, *Nepenthes*, *Cephalotus* and *Darlingtonia* pitchers if you desire. I always had too many plants to be selective and relied on the fogger to cover all areas. The important fact is to direct the spray to the plants, not to the medium. This is wasteful of fertilizer, and excessive use could eventually alter the medium's composition in closed unit terrariums.

You have been given "just the facts" to get you started in developing a synthetic CP fertilizing program. The fun starts with the results.

WANT ADS

When submitting Want Ads, please be sure to print clearly for best results and to eliminate mistakes. Please circle the correct letter before each item (Want, Trade, Sell or Buy). Want ads are limited to carnivorous plants, terrariums, greenhouses and moss. There is a charge of ten cents per item, with no limit to the number of items you may submit per issue.

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Matthew Hochberg (5500 Fieldston Road,^{*} Bronx, New York 10471) (WTB) Any South American *Drosera* except *intermedia*, *capillaris*, *montana* and *villosa* "Ascendens", Any South African *Drosera* (except *capensis* and *aliciae* including unnamed species), Unusual or rare *Drosera* species, *Drosera* hybrids, *Drosera linearis*, *Drosera falconeri*; Any *Heliamphora* (except minor): (W) overseas and domestic correspondence.

Lee's Botanical Gardens (12731 SW 14th St., Miami, FL 33184) B-S-T all varieties of Carnivorous plants. List free. S-N.x *excellens* \$10. ea., *N. sanguinea* \$35. ea., *S. flava* var. *atropurpurea* \$12. ea.

David Pillars (122 Nelson St., Hastings, MI 49058) (W) Any species of *Heliamphora*, seeds and established plants. Send me your price.

Jim Scott (1375W. 1000 North Markle, IN 46770) (B) plants or seeds of the following: *D. anglica*, *D. linearis*, *D. brevifolia*, *D. filiformis*, *D. filiformis tracyi*; *P. villosa*, *P. pumila*, *P. vulgaris*, *P. lutea*, *P. caerulea*, *P. planifolia*, *P. primuliflora*, *P. grandiflora*; *S. rubra jonesii*, *S. oreophila*, *S. minor* (giant), *S. flava* (red splotch on the id column), *S. flava* (green lid, red tube), *S. flava* (all red form), *S. flava* (heavy veined), *S. purpurea* f. *heterophylla*. Send me your price.

IRELAND, *Native Species*, continued from page 44.

Those are the native carnivorous plants, but Ireland now is the home of an exotic alien, *Sarracenia purpurea*, and at least one other American carnivore, *Darlingtonia californica*, will grow out-of-doors without protection.

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Walsh, L. 1978. *Richard Heaton of Ballykenagh*. Roscrea.

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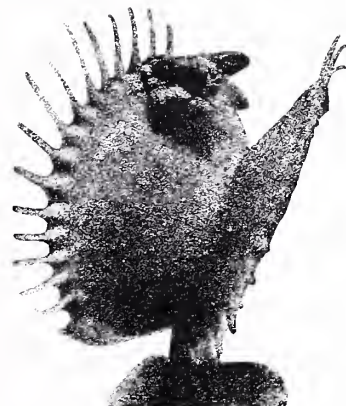
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Pinguicula grandiflora, an original watercolour painting by Wendy Walsh, published in *An Irish Florilegium* by W.F. Walsh, R.I. Ross and E.C. Nelson (London, 1983).